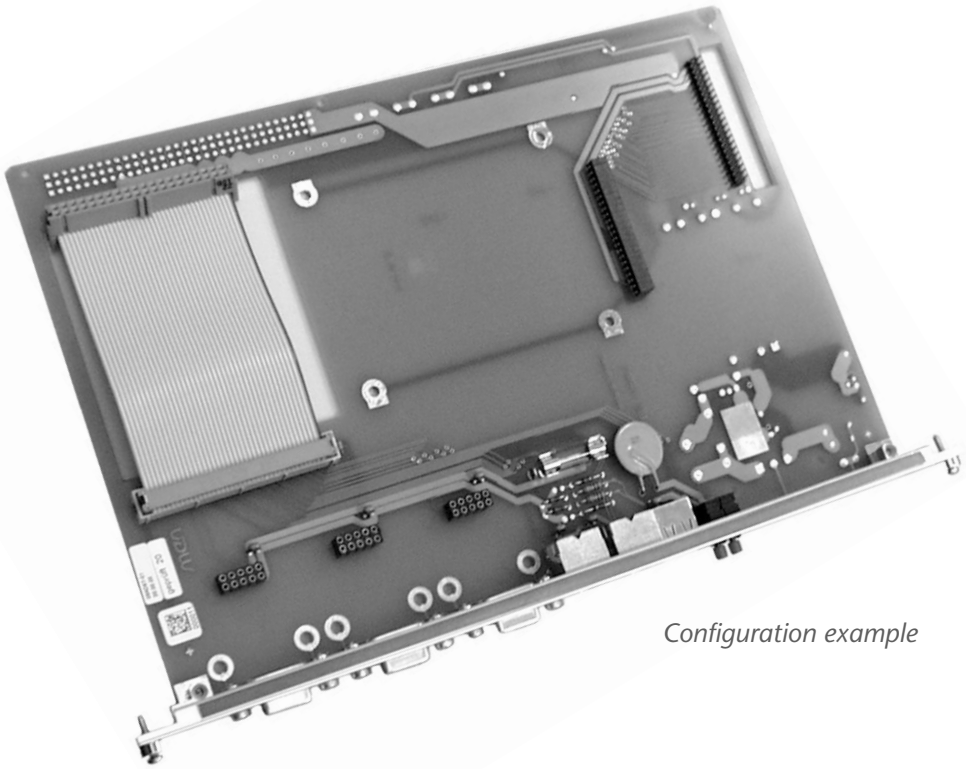
Embedded Solutions

AD67 – 6U I/O Extension for A12, A15, D3, SC13



Configuration example

User Manual

mikro elektronik
gmbh · nürnberg

AD67 – 6U I/O Extension for A12, A15, D3, SC13

The AD67 is an I/O extension card for a variety of MEN CPU cards in 6U format such as the VME SBC families A12 and A15, the CompactPCI SBC family D3 or the stand-alone SBC family SC13. The AD67 is directly connected to the respective single-board computer – without being connected to a VME or CompactPCI backplane. Its purpose is to provide physical access to several onboard functions of the above named SBCs. The AD67 provides connectors for USB, two PS/2 (keyboard/mouse), a 2.5" hard disk and three SA-Adapters™.

Especially the SA-Adapters™ allow flexible configuration with all kinds of legacy serial I/O - also optically isolated - like RS232, RS422, RS485. The front panel comes with two user LEDs and two switches for reset/abort. The AD67, together with the respective SBC, takes two slots in a VME or CompactPCI system (8 HP).

Technical Data

Peripheral Connections

- COM2 to COM4
  - TTL signal level
  - For easy connection of MEN SA-Adapters™
  - Connectors at front panel
- PS/2 keyboard
- PS/2 mouse
- USB
- IDE connector for onboard 2.5" hard disk

Miscellaneous

- Reset/abort buttons
- 2 user LEDs

Connection to CPU Board

- Connection to COM2..4, PS/2, USB, buttons and LEDs via 40-pin ribbon cable
- Connection to onboard 2.5" hard disk via 44-pin ribbon cable

Electrical Specifications

- MTBF: 195 000 h @ 50°C (without hard disk) (derived from MIL-HDBK-217F)

Mechanical Specifications

- Dimensions: standard double Eurocard, 233.3 mm x 160 mm
- Weight: 204 g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C without hard disk
  - +5..+55°C with hard disk
  - Industrial temperature range on request
  - Airflow: min. 10 m³/h
- Temperature range (storage):
  - -40..+85°C without hard disk
  - -40..+65°C with hard disk
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300 m to +3000 m
- Shock: 15 g, 11 ms
- Bump: 10 g, 16 ms
- Vibration (sinusoidal): 2 g, 10..150 Hz
- Conformal coating on request

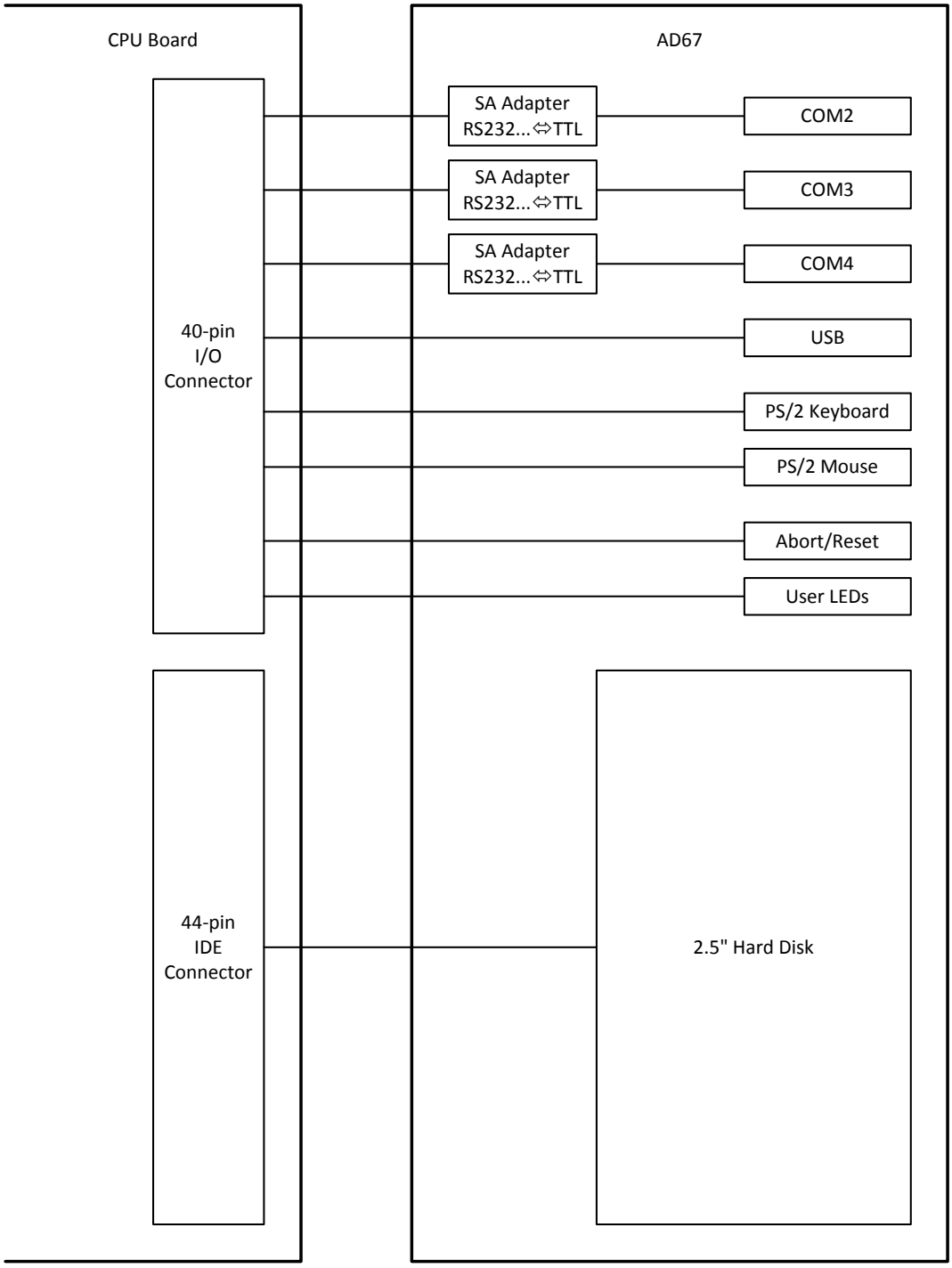
Safety

- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst)

Block Diagram



Product Safety

Electrostatic Discharge (ESD)

Computer boards and components contain electrostatic sensitive devices. Electrostatic discharge (ESD) can damage components. To protect the board and other components against damage from static electricity, you should follow some precautions whenever you work on your computer.

- Power down and unplug your computer system when working on the inside.
- Hold components by the edges and try not to touch the IC chips, leads, or circuitry.
- Use a grounded wrist strap before handling computer components.
- Place components on a grounded antistatic pad or on the bag that came with the component whenever the components are separated from the system.
- Store the board only in its original ESD-protected packaging. Retain the original packaging in case you need to return the board to MEN for repair.

About this Document

This user manual is intended only for system developers and integrators, it is not intended for end users.

It describes the hardware functions of the board, connection of peripheral devices and integration into a system. It also provides additional information for special applications and configurations of the board.

The manual does not include detailed information on individual components (data sheets etc.). A list of literature is given in the appendix.

History

Issue	Comments	Date
E1	First edition	2003-05-09
E2	General update	2012-09-25

Conventions

This sign marks important notes or warnings concerning the use of voltages which can lead to serious damage to your health and also cause damage or destruction of the component.

This sign marks important notes or warnings concerning proper functionality of the product described in this document. You should read them in any case.

italics — Folder, file and function names are printed in *italics*.

bold — **Bold** type is used for emphasis.

`monospace` — A `monospaced` font type is used for hexadecimal numbers, listings, C function descriptions or wherever appropriate. Hexadecimal numbers are preceded by "0x".

comment — Comments embedded into coding examples are shown in green color.

hyperlink — Hyperlinks are printed in blue color.

The globe will show you where hyperlinks lead directly to the Internet, so you can look for the latest information online.

IRQ#
/IRQ — Signal names followed by "#" or preceded by a slash ("/") indicate that this signal is either active low or that it becomes active at a falling edge.

in/out — Signal directions in signal mnemonics tables generally refer to the corresponding board or component, "in" meaning "to the board or component", "out" meaning "coming from it".

Vertical lines on the outer margin signal technical changes to the previous issue of the document.

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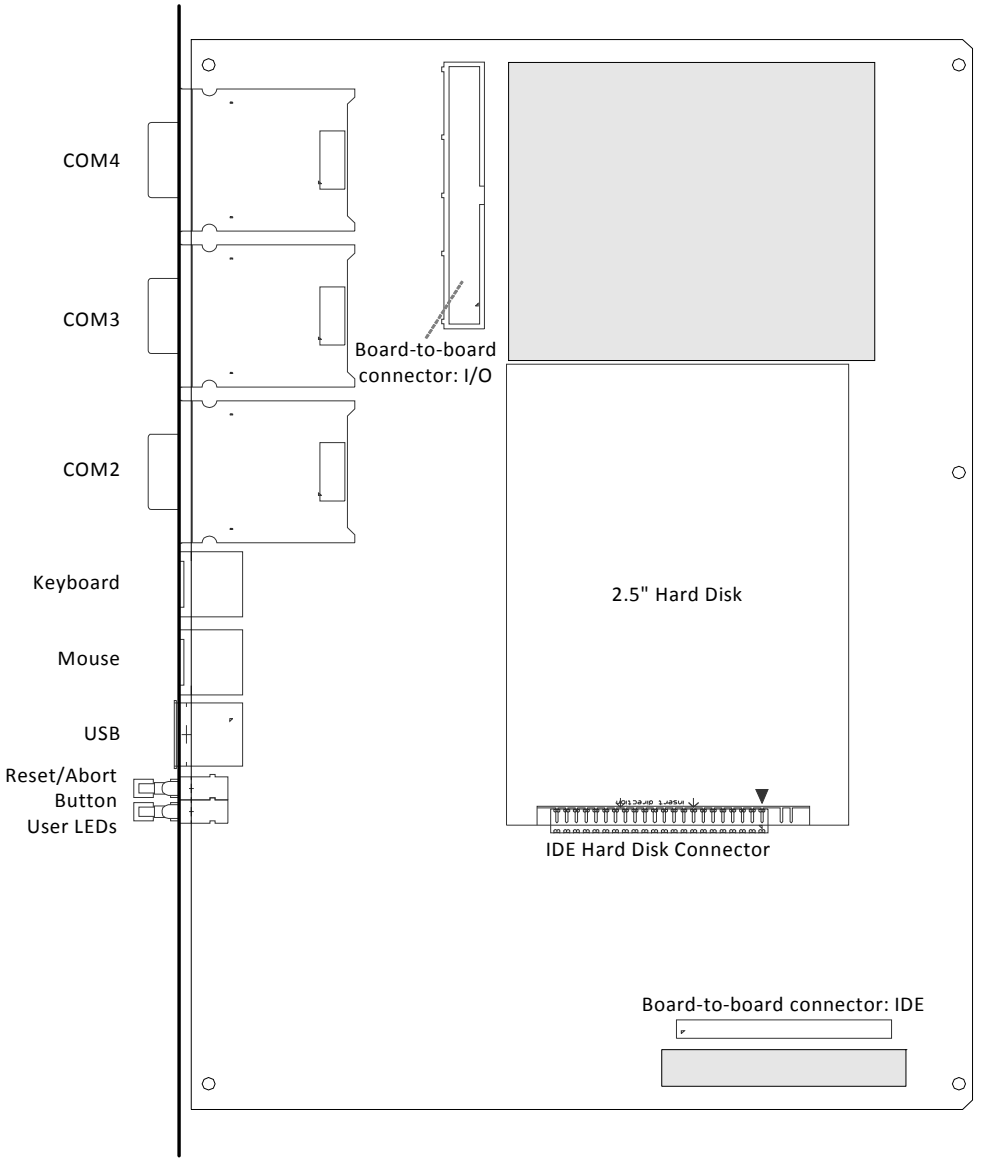
1 Getting Started

This chapter will give an overview of the adapter card and hints on installation.

1.1 Map of the Board

Figure 1. *Map of the board – top view*



1.2 Connecting the Adapter to a CPU Board

The AD67 I/O extension card was designed for use in standard 6U systems such as CompactPCI or VMEbus. It can be connected via ribbon cable to MEN CPU boards that feature a 40-pin I/O connector, e.g., MEN's A12, A15 or D3 CPUs.

Do the following to install the AD67:

- ☑ Make sure you have added any additional parts on the board that you may need, e.g., SA-Adapters or hard disk.
- ☑ Power-down your system.
- ☑ Remove the CPU board to be extended by AD67 from the system.
- ☑ Make sure the neighboring slot of your bus system to the right of the CPU board is free.
- ☑ Hold the AD67 over the CPU board and align the 40-pin ribbon cable included with AD67 with the corresponding 40-pin connector of the CPU board.

- ☑ Firmly connect the ribbon cable connector to the CPU board's connector.
- ☑ In the same fashion, you will have to connect the 44-pin IDE plug connectors on AD67 and the CPU board via a ribbon cable, if you have installed a hard disk on AD67. See also Chapter 3.1 IDE Hard Disk Interface on page 15.
- ☑ Insert the two boards into two parallel slots of the bus system.
- ☑ Lock the CPU board's ejector handles.
- ☑ Screw the AD67's front-panel screws to the bus system slot.

2 Interface to the CPU Board

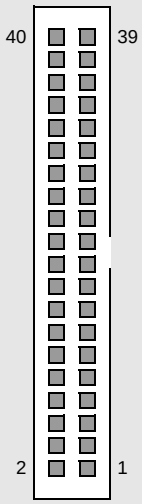
The AD67 is directly connected to the CPU board's I/O connector via ribbon cable.

Connector types:

- 40-pin low-profile plug, 2.54 mm pitch, for ribbon-cable connection
- Mating connector:
  40-pin IDC receptacle, e.g. Elco Series 8290 IDC socket

The different functional groups are marked through different colors in the tables.

Table 1. *Pin assignment of the 40-pin I/O connector*



40	-	39	-
38	-	37	-
36	-	35	-
34	-	33	-
32	RXD4	31	-
30	TXD4	29	-
28	RXD3	27	TXD3
26	+5V	25	GND
24	USBP0+	23	USBP0-
22	+5V	21	GND
20	MSDATA	19	MSCLK
18	KBDATA	17	KBCLK
16	LED2	15	LED1
14	ABRTBTN#	13	PWRBTN#
12	+5V	11	GND
10	RI2#	9	DCD2#
8	CTS2#	7	DSR2#
6	RTS2#	5	DTR2#
4	RXD2	3	TXD2
2	+5V	1	GND

Table 2. *Signal mnemonics of 40-pin I/O connector*

	Signal	Function
Power	+5V	+5V power supply
	GND	Digital ground of respective interface
Mouse/Keyboard	KBDATA	Keyboard data
	KBCLK	Keyboard clock
	MSDATA	Mouse data
	MSCLK	Mouse clock
LEDs	LED1	LED1
	LED2	LED2
Button	ABRTBTN#	Abort button
	PWRBTN#	Reset button
COM2	CTS2#	Serial port COM2 clear to send
	DCD2#	Serial port COM2 data carrier detect
	DSR2#	Serial port COM2 data set ready
	DTR2#	Serial port COM2 data terminal ready
	RI2#	Serial port COM2 ring indicator
	RTS2#	Serial port COM2 request to send
	RXD2	Serial port COM2 receive data
	TXD2	Serial port COM2 transmit data
COM3/COM4	RXD3	Serial port COM3 receive data
	TXD3	Serial port COM3 transmit data
	RXD4	Serial port COM4 receive data
	TXD4	Serial port COM4 transmit data
USB	USBP0+, USBP0-	USB port differential pair

Note: This I/O connector is the link between the CPU board I/O signals and the AD67's peripheral connectors, buttons and LEDs. Since you can view the signals from either side of the connector (coming in and going out), signal directions were omitted in this table to avoid confusion.

3 Interfaces to I/O Devices

3.1 IDE Hard Disk Interface

The AD67 supports one IDE channel via a 44-pin connector. You can only connect a master device. The card provides enough space for direct mounting of a 2.5" hard disk. MEN offers a suitable hard disk together with any accessories needed for mounting. For ordering options, please see MEN's website.

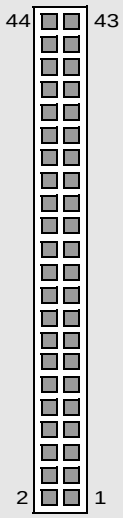
The AD67 actually has two 44-pin IDE connectors. One is for connection of the hard disk, the other for connection to the CPU board's IDE connector. If you have installed a hard disk, you also need to connect the latter to the CPU board via ribbon cable. A suitable cable is included in MEN's hard disk mounting kit. See also Figure 1, Map of the board – top view, on page 11 and Chapter 1.2 Connecting the Adapter to a CPU Board on page 12.

The pinning of the IDE connectors complies with the ATA-4/ATAPI specification.

Connector types:

- 44-pin, 2-row receptacle, 2mm pitch
- Mating connector:
  44-pin, 2-row plug, 2mm pitch

Table 3. *Pin assignment of the 44-pin IDE connector*



44	-	43	GND
42	+5V	41	+5V
40	GND	39	IDE_DASP#
38	IDE_CS3#	37	IDE_CS1#
36	IDE_A[2]	35	IDE_A[0]
34	IDE_ACT#	33	IDE_A[1]
32	-	31	IDE_IRQ
30	GND	29	IDE_DAK#
28	IDE_CSEL	27	IDE_RDY
26	GND	25	IDE_RD#
24	GND	23	IDE_WR#
22	GND	21	IDE_DRQ
20	-	19	GND
18	IDE_D[15]	17	IDE_D[0]
16	IDE_D[14]	15	IDE_D[1]
14	IDE_D[13]	13	IDE_D[2]
12	IDE_D[12]	11	IDE_D[3]
10	IDE_D[11]	9	IDE_D[4]
8	IDE_D[10]	7	IDE_D[5]
6	IDE_D[9]	5	IDE_D[6]
4	IDE_D[8]	3	IDE_D[7]
2	GND	1	IDE_RST#

Table 4. *Signal mnemonics for 44-pin IDE connector*

Signal	Direction	Function
+5V	-	+5V power supply
GND	-	Digital ground
IDE_A[2:0]	out	IDE address [2:0]
IDE_ACT#	in	IDE active
IDE_DASP#	in/out	IDE device active or slave (device 1) present
IDE_CS1#	out	IDE chip select 1
IDE_CS3#	out	IDE chip select 3
IDE_CSEL	out	IDE cable select
IDE_D[15:0]	in/out	IDE data [15:0]
IDE_DAK#	out	IDE DMA acknowledge
IDE_DRQ	in	IDE DMA request
IDE_IRQ	in	IDE interrupt request
IDE_RD#	out	IDE read strobe
IDE_RDY	in	IDE ready
IDE_RST#	out	IDE reset
IDE_WR#	out	IDE write strobe

3.2 Serial Ports COM2..COM4

For serial ports COM2 to COM4, three 10-pin connectors are provided that allow direct mounting of MEN SA-Adapters. These adapters provide flexible interfacing, from RS232 to TTY. All serial interfaces are available at the front panel.

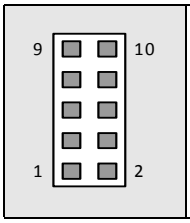
Unlike COM3 and COM4, COM2 also supports handshake lines.

For different SA-Adapters available, see MEN's website.

Connector types:

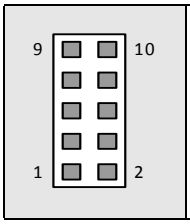
- 10-pin IDC receptacle, 2.54mm pitch, for ribbon-cable connection
- Mating connector:
  10-pin low-profile plug

Table 5. *Pin assignment of the 10-pin COM2 serial port connector*



9	DCD#	10	RI#
7	DSR#	8	CTS#
5	DTR#	6	RTS#
3	TXD	4	RXD
1	GND	2	+5V

Table 6. *Pin assignment of the 10-pin COM3..COM4 serial port connectors*



9	-	10	-
7	-	8	-
5	-	6	-
3	TXD	4	RXD
1	GND	2	+5V

Table 7. *Signal mnemonics for 10-pin serial port connectors*

Signal	Direction	Function
+5V	-	+5V power supply
CTS#	in	Clear to send
DCD#	in	Data carrier detect
DSR#	in	Data set ready
DTR	out	Data terminal ready
GND	-	Digital ground
RI#	in	Ring indicator
RTS#	out	Request to send
RXD	in	Receive data
TXD	out	Transmit data

3.2.1 Installing SA-Adapters

To mount an SA-Adapter, you must first remove the respective filler panel:

☑ Loosen and remove the two cross-recess screws accessible at the front panel.

☑ Remove the filler panel.

Now you can directly plug the SA-Adapter as described in the SA-Adapter user manual. You can download the manuals from MEN's website.

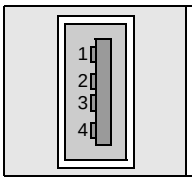
3.3 USB Interface

The AD67 has a standard USB interface accessible at the front panel. The USB version and data rates depend on the CPU board.

Connector types:

- 4-pin USB Series A receptacle according to Universal Serial Bus Specification Revision 1.1
- Mating connector:
  4-pin USB Series A plug according to Universal Serial Bus Specification Revision 1.1

Table 8. *Pin Assignment of USB Connector*



1	+5V
2	USBP-
3	USBP+
4	GND

Table 9. *Signal Mnemonics of USB Connector*

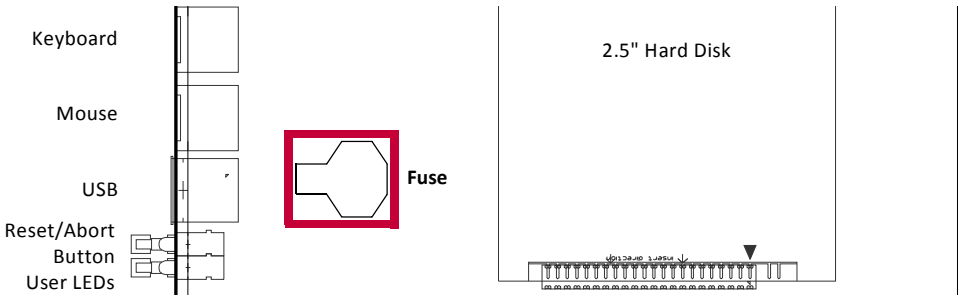
Signal	Direction	Function
+5V	-	+5V power supply, current-limited to 250 mA by a polyswitch fuse
GND	-	Digital ground
USBP-, USBP+	in/out	USB port lines, differential pair

3.3.1 Fuse Protection

The power pin of the USB connector is protected by a fuse. **This fuse is not intended to be exchanged by the customer. Your warranty for the AD67 will cease if you exchange the fuse on your own.** Please send your board to MEN for repair if a fuse blows.

- Current rating: 250 mA
- Type: PolySwitch RXE
- Size: diameter 7.4 mm
- MEN part number: 5002-0016

Figure 2. *Position of fuse for USB protection on top side of PCB*



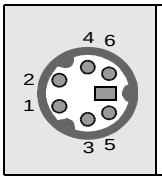
3.4 PS/2 Keyboard and Mouse Interfaces

Two 6-pin mini DIN connectors are provided to connect a standard PS/2 keyboard and mouse or other pointing device.

Connector types:

- 6-pin circular mini DIN receptacle
- Mating connector:
  6-pin circular mini DIN plug, available for soldering and crimp connection

Table 10. *Pin assignment of the 6-pin mini DIN keyboard connector*

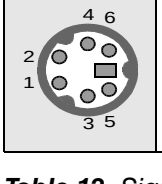


2	-	4	+5V	6	-
1	KBDATA			5	KBCLOCK
		3	GND		

Table 11. *Signal mnemonics for keyboard interface*

Signal	Direction	Function
+5V	-	+5V supply, current-limited to 315 mA by a fuse
GND	-	Logic ground
KBCLOCK	out	Keyboard clock
KBDATA	in/out	Keyboard data

Table 12. *Pin assignment of the 6-pin mini DIN mouse connector*



2	-	4	+5V	6	-
1	MSEDATA			5	MSECLOCK
		3	GND		

Table 13. *Signal mnemonics for mouse interface*

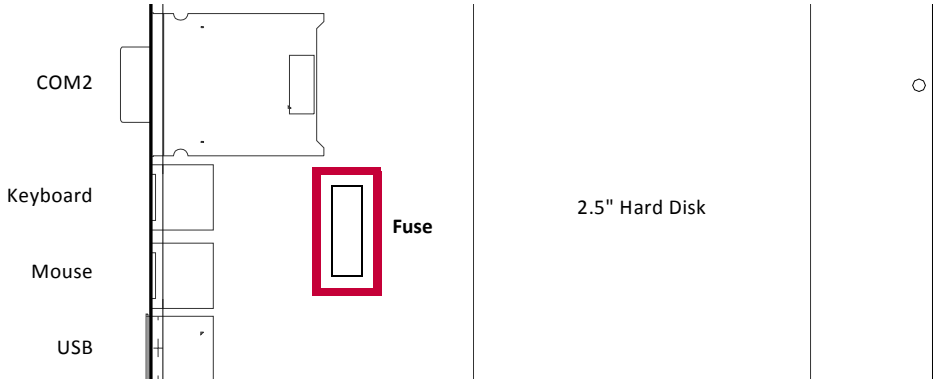
Signal	Direction	Function
+5V	-	+5V supply, current-limited to 315 mA by a fuse
GND	-	Logic ground
MSECLOCK	out	Mouse clock
MSEDATA	in	Mouse data

3.4.1 Fuse Protection

The power pins of the keyboard and mouse connectors are protected by a fuse. **This fuse is not intended to be exchanged by the customer. Your warranty for the AD67 will cease if you exchange the fuse on your own.** Please send your board to MEN for repair if a fuse blows.

- Current rating: 315 mA
- Type: fast
- Size: 5 x 20 mm
- MEN part number: 5475-0021

Figure 3. *Position of fuse for keyboard/mouse protection on top side of PCB*



3.5 Reset/Abort Buttons

The AD67 provides standard reset and abort buttons at the front panel.

3.6 User LEDs

The AD67 provides two user LEDs at the front panel. Their function depends on the CPU board and is configurable via software.

4 Appendix

4.1 Literature and Web Resources

- AD67 data sheet with up-to-date information and documentation:
  www.men.de/products/08AD67-.html

4.1.1 EIDE

- EIDE:
  Information Technology - AT Attachment-3 Interface (ATA-3), Revision 6, working draft; 1995; Accredited Standards Committee X3T10

4.1.2 USB

- USB Implementers Forum, Inc.
  www.usb.org

4.2 Finding out the Product's Article Number, Revision and Serial Number

MEN user documentation may describe several different models and/or design revisions of the AD67. You can find information on the article number, the design revision and the serial number on two labels attached to the board.

- **Article number:** Gives the product's family and model. This is also MEN's ordering number. To be complete it must have 9 characters.
- **Revision number:** Gives the design revision of the product.
- **Serial number:** Unique identification assigned during production.

If you need support, you should communicate these numbers to MEN.

Figure 4. *Labels giving the product's article number, revision and serial number*